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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,245	09/24/2003	Kwang-Wook Lee	2522-038	8148
7590	07/14/2004		EXAMINER	
MARGER JOHNSON & McCOLLOM, P.C. 1030 S.W. Morrison Street Portland, OR 97205			PERT, EVAN T	
			ART UNIT	PAPER NUMBER
			2829	

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Applicati n No.	Applicant(s)	
	10/671,245	LEE ET AL. 4	
	Examiner	Art Unit	
	Evan Pert	2829	

-- The MAILING DATE of this c mmunication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 1-2 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>0903</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 3-13 in the reply filed on 5-12-04 is acknowledged. Accordingly, claims 1-2 are withdrawn from consideration as being drawn to a non-elected invention.

Specification and Claim Objections

2. The claims and specification are objected to for applicant's unconventional use of "hydrogen fluoric acid" to mean --hydrofluoric acid-- (commonly called "HF").

The unconventional terminology of "hydrogen fluoric acid" in this instance is objectionable since HF is so well known that it should be identified by its proper English name, for clarity.

For purposes of examination, applicant's term "hydrogen fluoric acid" appearing in the specification and claims is considered as being synonymous with "HF" and "hydrofluoric acid" known in the prior art. Correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 3-5 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Rath et al. (U.S. 6,630,074).

Regarding claims 3-4, Rath et al. disclose a method of cleaning a semiconductor device [top of col. 2] comprising: preparing a cleaning solution including about 1 to about 10 percent by weight of sulfuric acid (i.e. 0.01 to 15 percent per col. 3), about 0.5 to about 5 percent by weight of an aqueous hydrogen peroxide solution (i.e. 0.01 to 20 percent per col. 3), and "about 0.1 to about 100 ppm hydrofluoric acid" [which anticipates "about 85 to about 98.5 percent by weight of a hydrogen fluoric acid solution" as claimed since dependent claim 4 specifies about 50 ppm HF in the "cleaning solution" when the hydrofluoric acid solution is prepared according to combining "about 1,000 ml of deionized water and about 0.1 to about 2 ml of hydrogen fluoric acid," wherein "the hydrogen fluoric acid has a concentration of about 45 to about 55 percent"]; "removing polymers attached to a metal wiring formed on a substrate" by immersing the substrate in the "cleaning solution" [top of col. 2, with "immersion" in the cleaning solution of Rath et al. being *implicit disclosure* understood to the ordinary of skill per MPEP 2144.01]; and rinsing (i.e. to remove remaining cleaning solution and contaminants) and drying the wafer substrate [col. 5, lines 17-19].

Regarding claim 5, Rath et al. disclose that the solution is used at 30°C to 50°C, preferably 35°C (which is *about 20°C to about 30°C*).

Regarding claim 8, Rath et al. anticipate removing all three types of polymers claimed because Rath et al. states that the residue materials include "oxygen" (i.e. oxygen-containing polymer), carbon (i.e. organic polymer), and "elements of an underlying conductive layer" [col. 2, line 42] such as "aluminum" [col. 2, line 3].

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rath et al., as applied to claim 5 above, along with the following:

Regarding claim 6, Rath et al. is silent about subjecting the wafer to the cleaning solution for "about 1 to about 9 minutes", and instead disclose etching rates in angstroms per minute (e.g. Table 1). It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to chose 1 to 9 minutes by routine experimentation for the cleaning etch, motivated by a desire for etching long enough to remove the polymer residue, but not so long as to cause damage to any structure that was formed, based on disclosed etching rates, in Table 1 for example.

6. Claims 7 and 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rath et al., as applied to claims 3-4 above, and further in view of Wada et al. (U.S. 6,664,196).

With respect to claim 7, Rath et al. is drawn to removing polymer residue from etched aluminum lines "or lines made of other conductive materials," but is silent about using the disclosed cleaning solution *specifically* to remove polymer residue when etching "a gate electrode that includes tungsten."

Likewise, with respect to claims 9-13, Rath et al. is silent about using the disclosed cleaning solution in a process with a polysilicon film, a tungsten film, and a nitride film successively formed on a substrate and patterned with a mask that is removed.

Regarding claim 9, Wada et al. disclose cleaning polymer residue after etching a gate stack meeting the limitations of lines 2-8 of claim 9. It would have been obvious to use the cleaning solution disclosed by Rath et al. in place of the cleaning solution disclosed by Wada et al., motivated by the "environmental" advantage disclosed by Rath et al. [col. 3, lines 5-7], knowing that Rath et al. explains their cleaning solution is not just for "aluminum," but for "lines made of other conductive materials as well" [col. 3, lines 5-6].

Regarding claim 10, Wada et al. disclose barrier layer 25, for example.

Regarding claim 11, Wada et al. disclose a "gate electrode".

Regarding claim 12, one of ordinary skill in the art would have been motivated at the time of applicant's claimed invention to adopt temperatures specified by Rath et al. when adopting their cleaning method as an alternative, motivated by the directions of how to use the cleaning solution of Rath et al..

Regarding claim 13, Wada et al. speak of 1, 2 or 3 minutes for their cleaning solution [Table 1], so it would have been obvious to immerse in the cleaning solution for "about 1 to about 9 minutes," motivated to clean the polymer residue without damaging metal as taught by both Wada et al. and Rath et al..

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Florez is cited for teaching, "rinsing" and "drying" a wafer after "immersing" the wafer in a "cleaning solution" as is notoriously well known in the semiconductor device processing art [cols. 1-4].


8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969. The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2829

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ETP
July 8, 2004



EVAN PERT
PRIMARY EXAMINER